

BROWN, VENCE & ASSOCIATES



Review of Animal Waste Management Regulations

Task 3 Report: Comparison of Regulations
Designed to Protect Groundwater Quality From
Releases of Confined Animal Facilities

San Jose State University Foundation

Final Report | February 2004



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This final *Task Three Report: Comparison of Regulations Designed to Protect Groundwater Quality From Releases of Confined Animal Facilities* was prepared by Brown, Vence & Associates (BVA) for the San Jose State University Foundation under Contract Account No. 22-1509-3083 under the State Water Resources Control Board (SWRCB) Standard Agreement Number 01-281-150-0. Principal authors of this study were:

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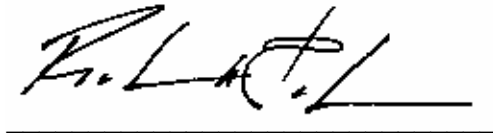
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Review of Animal Waste Management Regulations

Task 3 Report: Comparison of Regulations Designed to Protect Groundwater Quality From Releases of Confined Animal Facilities

San Jose State University Foundation

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(Appendices bound separately. The content of each appendix is listed below.)

Appendix A | Agriculture Waste Management Handbook

Chapter 7, Geologic and Ground Water Considerations

Chapter 10, Agricultural Waste Management System Component Design

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Task 3 Report:

Comparison of Regulations Designed to Protect Groundwater Quality From Releases of Confined Animal Facilities

Section 1 Introduction

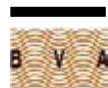
Title 27 of the California Code of Regulations (CCR) is the principal regulation to protect state surface and groundwater quality from confined animal facility discharges. The regulations are implemented by the State Water Resources Control Board (SWRCB) through the nine Regional Water Quality Control Boards (RWQCB). In addition to the minimum design standards included in Title 27, confined animal facilities in California may also be subject to local and federal regulations intended, in part, to protect human health and the environment. In recent years, some federal and local regulations have been strengthened due to heightened public concern regarding risks to surface and groundwater resources that are posed by confined animal facility wastes. The primary purpose of this report is to identify federal, state, and local regulations for retention ponds, corrals, and milk production areas which are intended to protect groundwater quality and to assess the effectiveness of these regulations for siting, design, construction, maintenance, operations, and closure of confined animal facilities.

1.1 Background

Confined animal facility operations typically concentrate animals in feeding areas, milk production areas, and within open corrals. Facility waste typically includes manure, bedding, hair, spilled feed, and leachate from silage. The composition of animal manure depends on a number of factors such as the animal species, size, maturity, health, and composition of animal feed. Generally, the primary pollutants associated with animal wastes that have potential to affect groundwater include nitrogen compounds, salts, organic matter, pathogens, and to a lesser extent antibiotics, pesticides, and hormones.

Both wet and dry systems are used to manage these wastes. Dry management systems, such as tractor or chain-pull scrapers, are used by some confined animal facility operations to manage wastes from feeding areas and corrals. However, in many instances animal waste from feeding and milk production areas are flushed with water to sumps that separate solids and direct the waste slurry to a system of wastewater settling basins, lagoons, or retention ponds.

The U.S. Environmental Protection Agency (U.S. EPA) has firmly established that shallow groundwater can become contaminated with manure pollutants from water traveling through



the soil to the groundwater (U.S. EPA 2003). Within the Central Valley of California, this finding is corroborated by site-specific data and published information that indicates groundwater quality has been affected at a number of Central Valley dairy facilities, some of which are known to be in compliance with the current Title 27 minimum standards for the management of confined animal wastes (BVA 2003). The potential for nitrogen compounds (a component of animal waste) to affect groundwater quality is also recognized by a 1998 United States Geologic Survey (USGS) report that notes median nitrate concentrations in shallow groundwater wells in the San Joaquin Valley have increased significantly since the 1950s (Dubrovsky, et al. 1998). During this time, the number of confined animal facilities (particularly dairies) in the Central Valley has increased in size and number of animals confined. Dubrovsky, et al. (1998) indicate that confined animal facility waste is one source of the relatively higher nitrate concentrations.

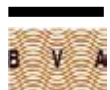
Within the Central Valley, the Central Valley RWQCB (CVRWQCB) regulates confined animal facilities under the minimum standards specified in CCR Title 27. In addition to Title 27, and as required by California Water Code (CWC) §13263, the RWQCB implements and applies the applicable Basin Plans for the Central Valley which incorporate the State Antidegradation Policy. Recent studies (BVA 2003) indicate current Title 27 requirements are insufficient to prevent groundwater contamination from confined animal facilities, particularly in vulnerable geologic environments. Although the RWQCB has authority to request more information in a Report of Waste Discharge (ROWD) than what is required in Title 27, Title 27 does not explicitly require site-specific information to be considered as part of confined animal facility design, construction, and operation. Therefore, in the absence of this request, the RWQCB cannot efficiently and reliably evaluate the nature and possible consequences of animal waste discharges on water quality, and thus cannot appropriately implement the applicable Basin Plan and State Antidegradation Policy requirements.

1.2 Purpose and Scope of Report

The purpose of this task report is to evaluate the effectiveness of other governmental regulations or guidelines for milk production areas, corrals, and retention ponds previously identified in the Task 2 Report as not being adequately regulated by Title 27 in protecting groundwater quality with respect to siting, design, construction, maintenance, operations, and closure of confined animal facilities. To meet this objective the following work was performed:

- Identification and review of federal regulations and guidelines intended to protect groundwater quality from confined animal facility discharges;
- Identification and review of regulations implemented by states other than California, intended to protect groundwater quality from confined animal facility discharges;
- Identification and review of selected local California county regulations intended to protect groundwater quality from confined animal facility discharges; and

- Evaluation of the effectiveness of these regulations and comparison with the current Title 27 requirements with respect to siting, design, construction, maintenance, operational and closure criteria.



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Section 2

Existing California Regulations

2.1 Regulatory Authority

California's primary water quality control law is the Porter-Cologne Water Quality Control Act (Porter-Cologne Act). The objective of the Porter-Cologne Act to protect surface water and groundwater quality is implemented through the CCR and the issuance of Water Discharge Requirements (WDRs). The SWRCB and its nine RWQCBs are the primary agencies that issue WDRs and regulate confined animal facilities through the authority of the Porter-Cologne Act and §22560 through §22565 of CCR Title 27.

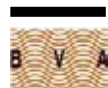
In accordance with CWC §13260, any person discharging or proposing to discharge wastes that could affect the quality of surface or groundwaters is required to file a ROWD with the appropriate RWQCB. The RWQCB uses this information to evaluate the nature of possible water quality consequences of the discharge and to prescribe WDRs. CWC §13263 requires that these WDRs implement both state and federal water quality control policies as well as the Basin Plan for the applicable area.

2.2 Basin Plan and the State Antidegradation Policy

Within the CVRWQCB region, Basin Plans have been established for the San Joaquin and Sacramento River Basins, and for the Tulare Lake Basin. These Basin Plans specify water quality objectives to protect the beneficial uses of surface water and groundwater, and include an implementation program to achieve the water quality objectives. The Basin Plans for the Sacramento and San Joaquin River Basins, and for the Tulare Lake Basin specifically include confined animal operations as one of the water quality concerns and note that runoff from these facilities can impair the beneficial uses of both surface water and groundwater (CVRWQCB 1995; 2002a). The Tulare Lake Basin Plan includes the additional requirement that new retention ponds be sited, designed, constructed, and operated to ensure the bottom of the pond is at least five feet above the highest anticipated groundwater elevation (CVRWQCB 1995; 2002b).

The State Antidegradation Policy (SWRCB Resolution 68-16) is incorporated into these Basin Plans and declares it is the policy of the state that granting of permits for waste disposal shall be regulated to achieve the highest water quality consistent with maximum benefit to the people of the state. The State Antidegradation Policy serves as the foundation for regulatory actions and includes the following specific policies (Dunham and Walker 2003):

- Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change in water quality will be consistent with maximum benefit to the people of the State, will not unreasonably



affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies.

- Any activity that produces or may produce waste or an increased volume of waste where existing or proposed discharges will enter existing high quality waters, will be required to meet discharge requirements that will result in the best practicable treatment or control of the waste. The discharge requirements are necessary to assure (a) that a pollution or nuisance will not occur; and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

The Basin Plans require the Regional Board to implement the State Antidegradation Policy when issuing a permit for a confined animal facility. Under this requirement, a ROWD must include information regarding the nature and extent of the discharge and the potential for the discharge to affect surface or groundwater quality in the region.

2.3 CCR Title 27 Minimum Standards

Specific CCR Title 27 minimum standards that pertain to confined animal facilities include:

- **§22560 - Applicability.** The specific purpose of this section is to explain that the scope of the regulation is to set forth minimum standards for discharges of animal wastes and to describe what general information should be submitted by a discharger subject to the regulations. This section describes the application of minimum standards for discharges of animal waste at confined animal facilities and requires the discharger to submit a ROWD that provides information identifying the average daily volume of wastewater generated and volume or weight of manure, total animal population and types of animals, location and size or use of disposal fields and retention ponds, and animal capacity of the facility.
- **§22561 - General Standard for Surface Water.** The specific purpose of this regulation is to describe general standards for confined animal facilities. This section requires that the discharger prevent animals at confined animal facilities from entering any surface water within the confined area.
- **§22562 - Wastewater Management.** The specific purpose of this regulation is to describe requirements for facilities relative to the handling of wastewater and the control of precipitation and drainage with the goal of reducing infiltration. This section provides the minimum standards for wastewater management and includes design storm criteria for run-on and runoff control and flood protection, retention pond design, and discharge to disposal or use fields. Section 22562 also contains an exclusion for manured area run-on.
- **§22563 - Use or Disposal Field Management.** The specific purpose of this regulation is to describe the performance standards for managing disposal fields to preclude degradation of ground or surface waters. This section requires that application of manure and wastewater to disposal fields or croplands be at rates which are reasonable for the crop, soil, climate, special local situations, management system, and type of

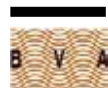
manure. Section 22563 also requires that discharge to disposal fields be managed to minimize percolation to groundwater.

- **§22564 - Management of Manured Areas.** The specific purpose of this section is to specify performance standards for the management of manured areas. In accordance with this section, manured areas must be managed to minimize infiltration of water into the underlying soils.
- **§22565 - Monitoring.** The specific purpose of this section is to indicate that monitoring of surface or groundwater may be required at confined animal facilities to determine if waste is entering the ground or surface water. This section allows the RWQCB to require a monitoring program as a condition to the issuance or waiver of WDRs.

2.4 Effectiveness of Title 27 Requirements in Protecting Groundwater Quality

Based on data from Central Valley dairies and from the information included in published studies, BVA (2003) concluded current Title 27 requirements are insufficient to prevent groundwater contamination from confined animal facilities, particularly in vulnerable geologic environments. These findings were corroborated by Central Valley data (CVRWQCB 2003; Boyle Engineering 2001; Lowry 1987) that indicated animal wastes have affected groundwater quality at a number of Central Valley dairies. These findings were also supported by the results of the multi-year study of dairies in the Central Valley by Harter, et al. (2002) and by USGS data (Dubrovsky, et al. 1998). These studies showed that shallow groundwater below dairies is degraded by high levels of nitrates and salts and median nitrate concentrations in shallow groundwater wells in the San Joaquin Valley significantly increased post 1950 due to the rise in the number of dairies and other confined animal facilities in the region. Moreover, based on the limited information required by Title 27 to be included in a ROWD, BVA (2003) concluded it would be difficult for the CVRWQCB to reliably evaluate the nature and possible water quality consequences of animal waste discharges. Although the RWQCB has the authority to request more information in a ROWD than is required by Title 27, in absence of this request, the CVRWQCB cannot efficiently implement the applicable Basin Plan and State Antidegradation Policy requirements. Specific areas where Title 27 was identified as insufficient to protect groundwater quality included (BVA 2003):

- **Title 27 Operations Requirements.** Title 27 requires that manured areas be managed to “minimize” infiltration of water into the underlying soils. However, without setting an appropriate, quantifiable standard and without consideration of site-specific subsurface conditions, these requirements provide no assurance that groundwater will not be affected above regulatory limits by infiltration from manured areas such as corrals. This conclusion is supported by the Harter, et al. (2002) data that indicated specific conductivity values were significantly higher in corral and pond areas rather than in field areas, as a result of leaching. The conclusion is further corroborated by Adriano, et al. (1971) who demonstrated that measurably higher average concentrations of ammonium-nitrogen exist in soil profiles under corrals in comparison to control areas. The results of



these studies also documented increased nitrate and total salt concentrations in shallow groundwater when compared with concentrations of these constituents in control wells.

- **Title 27 Retention Pond Design Requirements.** Current Title 27 requirements do not require low-hydraulic conductivity containment systems for waste storage ponds. Rather, Title 27 requires only that retention ponds be lined with, or underlain by, soils which contain at least ten percent clay and not more than ten percent gravel. The hydraulic conductivity of materials that meet this criteria could range from 10^{-6} cm/sec to as much as 10^{-3} cm/sec or greater (other factors being equal, each order of magnitude change in hydraulic conductivity can result in a tenfold increase in seepage and contaminant loading). Based on these findings, there is no assurance that facilities meeting the Title 27 requirement of ten percent clay will be protective of groundwater. This conclusion is supported by data that indicates animal wastes have affected the groundwater below retention ponds at several Central Valley dairies that meet the Title 27 design requirements (BVA 2003).
- **Site Specific Conditions.** The effectiveness of Title 27 to protect groundwater quality is partially dependent on the nature and characteristics of subsurface conditions. However, Title 27 does not require consideration of subsurface geologic conditions or the depth to groundwater in the siting, design, construction, or operation of confined animal facilities or waste management systems. For cases where the facility is located in a stable area, is underlain by a sufficient and consistent thickness of fine-grained soils, and groundwater occurs at depth, the potential for groundwater degradation may be low. Conversely, groundwater could be degraded rapidly for a facility underlain by coarse-grained soils, fractured bedrock, and/or shallow groundwater. This conclusion is supported by data from published studies (e.g. Glanville, et al. 1999 and NCDENR 1998) that demonstrate the need for detailed siting, design, and construction guidelines that recognize the differences in the performance potential of various soils and geologic materials.
- **Title 27 Information Requirements.** Title 27 regulations require submittal of a ROWD that includes general information regarding the average daily volume of facility wastewater and volume or weight of manure; total animal population at the facility and types of animals; the location and size of use or disposal fields and retention ponds; and the animal capacity of the facility. However, Title 27 does not require that the ROWD address or otherwise consider site-specific geologic conditions important to groundwater protection. In absence of this information, the RWQCB cannot use the ROWD to reliably evaluate the nature and possible water quality consequences of the facility waste discharges. Therefore, without making a request for additional site-specific information, the RWQCB cannot dependably evaluate the nature and possible water quality consequences of animal waste discharges.

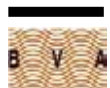
2.5 Other California Regulations

In addition to Title 27, CCR Title 3 (Food and Agriculture), Division 2 (Animal Industries), Chapter 1 (Dairies), Article 21 (Milk Inspection Services) requirements that are administered

by the California Department of Food and Agriculture (CDFA) include regulations that address the protection of water supplies in dairies and milk production plants. In general, the Title 3 regulations are not specifically intended to provide protection to surface and groundwater quality. However, as described below, some of the Title 3 requirements provide a measure of water quality protection, including:

- §622 (Protection of Water Supplies in Dairies and in Milk Production Plants). This section requires that no cross-connections may be installed between a safe water supply and any unsafe or questionable water supply.
- §646.1 (Surroundings, Corrals, and Ramps). This sections requires that dirt or unpaved corrals or ramps shall not be located closer than 25 feet from the milking barn or closer than 50 feet from the milk house. The section also provides minimum slope requirements for unpaved corrals and requires that all cow washing areas be paved and sloped to drain.
- §659 (Milking Barn). This section requires that floors, curbs, and gutters of the milking barn be constructed of concrete or other acceptable material and sloped to drain.
- §661 (Roof Drainage). This section requires that roof drainage from barns, milk houses, or shelters shall not drain into a corral unless the corrals are paved and properly drained.
- §662 (Feed Storage Facilities). This section requires that the feed discharge area of bulk feed storage facilities shall be paved with concrete or equal material, curbed, and sloped to drain.
- §665 (Water Supply). This section requires that wells must be located at least 50 feet from any animal enclosure, 100 feet from a septic tank leach line, and 150 feet from a seepage pit 8 feet or more deep.

Although these regulations lack direct correlation to groundwater quality, properly constructed and maintained facilities that conform to these regulations will provide a relatively impervious surface resulting in a reduction of infiltration and resulting groundwater affects. There is however, insufficient information to conclude if these regulations are effective in protecting groundwater.



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Section 3

Federal Regulations

There are no federal requirements that specifically address confined animal facilities and groundwater quality protection. Although the federal requirements are not directly applicable to groundwater protection, there are some regulations that may indirectly provide a measure of protection to groundwater quality from confined animal facility wastes. Additionally, the federal government has developed a set of guidelines intended to assist confined animal facility operators in complying with environmental regulations concerning animal waste. These guidelines include specific siting and design recommendations to provide groundwater quality protection. Additional information regarding the federal regulations and guidelines is summarized below.

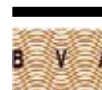
3.1 U.S. EPA Regulations

The Clean Water Act of 1977 (Public Law 95-217) requires that operators of point source discharges, such as those from industrial and municipal facilities, feedlots, and other discrete significant sources obtain a National Pollutant Discharge Elimination System (NPDES) permit. The U.S. EPA administers the NPDES permit process under Title 40 of the Code of Federal Regulations (CFR) Parts 9, 122, 123, and 412. Most states, including California, have been granted full NPDES permitting authority by the U.S. EPA, with the U.S. EPA providing oversight of the state operations.

Although the U.S. EPA indicates the overall objective of 40 CFR, Parts 9, 122, 123, and 124 is to ensure that all animal feeding operations manage their manure properly to protect water quality (U.S. EPA 2003), the EPA does not have the authority to regulate groundwater except where a direct hydrologic connection exists between the groundwater and surface waters. However, the federal regulations do not include a national requirement for operators to document a lack of direct hydrological connection from groundwater beneath their production area to surface waters, nor do they require the operators of confined animal facilities to add controls where there is such a connection.

Despite these limitations, some of the federal regulations may indirectly provide some measure of protection to groundwater quality from confined animal facility wastes. For example, the regulations establish a mandatory duty for all confined animal facilities of a specified minimum size apply for an NPDES permit and to develop and implement a nutrient management plan. The required nutrient management plan must identify the site-specific actions to be taken by the facility to ensure proper and effective manure and wastewater management, including compliance with the surface water effluent limits included in the NPDES permit.

Effluent limitations guidelines and standards (“effluent guidelines” or “ELGs”) are national regulations that establish limitations on the discharge of pollutants by industrial category and subcategory. As noted in U.S. EPA (2003) Section II, item 2 on page 7185, each category and subcategory guidelines address three classes of pollutants: (1) Conventional pollutants



(i.e., total suspended solids (TSS), oil and grease, biochemical oxygen demand (BOD), fecal coliform bacteria, and pH); (2) toxic pollutants (e.g., toxic metals such as lead and zinc; toxic organic pollutants such as benzene); and (3) non-conventional pollutants (e.g., phosphorus). These technology-based requirements are subsequently incorporated into NPDES permits. The Clean Water Act provides that effluent guidelines may include numeric or non-numeric limitations. Non-numeric limitations are usually in the form of Best Management Practices (BMPs) that are based on the degree of control that can be achieved using various levels of pollution control technology.

The ELGs included in 40 CFR Part 412 (U.S. EPA 2003) are primarily non-numeric BMPs in the form of Best Practicable Control Technology Currently Available (BPT), Best Conventional Pollutant Control Technology (BCT), Best Available Technology Economically Achievable (BAT) limitations, and New Source Performance Standards (NSPS) on discharges from the “production area” and the “land application areas” at the facility.¹ The “Development Document for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations” (U.S. EPA 2002) provides additional information regarding the performance expectations for BPTs, BCTs, BAT limitations, and NSPS.

3.2 Guidelines

The federal regulatory program described above is also supported and complemented by voluntary programs that are intended to assist animal feeding operations which are implemented by the United States Department of Agriculture (USDA), the U.S. EPA, and states. USDA guidelines are included in Part 651 (Agricultural Waste Management Field Handbook) of the National Engineering Handbook that was issued by the USDA in 1992.² The Field Handbook is the USDA’s official guide for adhering to environmental regulations concerning animal waste, and provides specific information regarding waste management system design. It has been revised and updated since 1992.

The most significant of the Field Handbook guidelines pertaining to groundwater protection are included in Chapter 7: Geologic and Ground Water Considerations (NRCS 1999), Chapter 10: Agricultural Waste Management System Component Design (NRCS 1997a), and Appendix 10D: Geotechnical, Design, and Construction Guidelines (NRCS 1997b). These chapters of the Field Handbook are included in Appendix A of this document. The general purposes and content of Chapters 7 and 10 (including Appendix 10D) include:

- **Chapter 7.** Although some agricultural waste management components can be installed on properly selected sites without any treatment other than accommodating prescriptive construction procedures, other sites may require special provisions to account for vulnerable geologic conditions. An important objective is to recognize and avoid potentially problematic site conditions early in the planning process. Therefore, Chapter

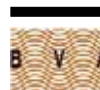
¹ The only numeric ELGs included in 40 CFR Part 412 are for duck facilities and include limitations for BOD and fecal coliform.

² The Agricultural Waste Management Field Handbook was originally issued by the USDA Soil Conservation Service (SCS) in 1992. The SCS became the Natural Resources Conservation Service (NRCS) in 1994.

7 focuses on preliminary planning and the detailed design stage of the site investigations, and provides guidance in a wide variety of engineering geologic issues and water quality considerations that may be encountered in investigation and planning.

- **Chapter 10 and Appendix 10D.** The protection of surface and groundwater and the proper management of wastes are the primary goals of waste storage ponds and treatment lagoons. Seepage from these structures creates potential risks of pollution to surface water and underground aquifers. Because the permeability of the soil in the boundaries of a constructed waste treatment lagoon or waste storage pond directly influences the potential for downward or lateral seepage of the stored wastes, the NRCS guidelines address the design and construction techniques needed to overcome certain soil limitations. According to NRCS (1997b), waste impoundments must be located in soils with acceptable permeabilities or be lined. NRCS also comments that compliance with the guidelines in the planning, design, construction, and operation of agricultural waste management components should provide somewhat conservative but reasonable levels of protection to groundwater resources.

A common component of the different NRCS guidelines is the observation that soil and foundation characteristics are critical to design, installation, and safe operation of successful waste treatment lagoons or waste storage ponds. EPA (2003) encourages confined animal facility operators to consider the guidelines as one method to ensure appropriate design and construction of facilities, and as described more fully in Sections 4 and 5, the NRCS guidelines have been adopted as minimum design standards for confined animal facility waste management by a number of states and local California counties.



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Section 4

State Regulations

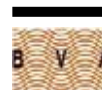
As summarized in Section 3, large confined animal facilities are regulated as point sources under the Clean Water Act and are subject to NPDES permit requirements that apply to the protection of surface water. In general, states are free to impose additional requirements on confined animal facilities and to regulate additional types of operations other than those governed by the federal NPDES requirements. As a result, many states regulate animal facilities of various sizes and descriptions under state laws and programs, some of which operate independently of their respective NPDES programs and some of which go beyond the federal regulations and include requirements to protect groundwater quality. Completion of a detailed identification and evaluation of all states laws, regulations, and requirements was outside the scope of this evaluation. However, representative information regarding different states programs was obtained from the following documents:

- The National Confinement Policy National Task Force (Task Force) completed a summary of responses to a questionnaire regarding the current status of animal waste and related feeding operation regulations in all states except West Virginia and Louisiana, who did not respond to the Task Force questionnaire (1999a; 1999b).
- Patton and Seidl (1999) compiled a matrix of state level policies for animal feeding operations based on several data sources, which addresses environmental and waste management requirements for different states.
- Czebiniak, et al. (2003) completed a summary of state regulations on animal feeding operations which provides detailed information regarding regulations intended to provide environmental protection from seven states: Alabama, Arkansas, Illinois, Indiana, Maryland, Nebraska, and Oregon.

Summary information from these documents is presented below and in the associated tables.

4.1 National Confinement Policy Task Force Questionnaire

During the summer and fall of 1998, extension faculty members from 12 Land Grant Universities developed and compiled responses to a state questionnaire about the current status of animal waste and related animal feeding operation regulations. Part II of the Task Force questionnaire focused on individual state confinement and manure management regulations that pertain to environmental protection. Summary information from Part II of the survey is presented in Tables 4-1 and 4-2 and complete state responses to Part II are included in Appendix B. The Task Force questionnaire was general and did not request specific information regarding regulations specific to the siting, design, construction, operations, maintenance, and/or closure of confined animal facilities. The questionnaire also did not address requirements that may be separately applicable or appropriate for milk barns, milk parlors, corrals, or retention ponds.



Final Report

As documented in these tables and Appendix B, there is considerable variation in confinement and manure management regulations between the responding 48 states. The spectrum of responses ranged from very limited, or essentially no state confinement and manure management regulations, to relatively comprehensive requirements. More significantly for the purposes of this task report, the responses to the questionnaire indicate an appreciable variation in state requirements for site characterization, testing, set-backs from surface water and groundwater wells, liner design, waste lagoon leakage, and groundwater monitoring. States with more requirements rely on the NRCS siting and design standards and guidelines identified in Section 3 and Appendix A.

TABLE 4-1 Summary of Confined Animal Policy Requirements Based on Responses From 48 States	
Concentrated Animal Feeding Operation Site Approval by Level of Government	<ul style="list-style-type: none">• 36 states have state agency approval of sites• 22 states have local agency approval of sites• 5 states have no government approval of sites• 3 states have federal approval of sites
Concentrated Animal Feeding Operation Setback Requirements	<ul style="list-style-type: none">• 29 states have setback requirements
General State Requirements for Site Approval	<ul style="list-style-type: none">• 28 states require physical and/or geologic testing• 22 states require public notice and/or hearings• 22 states require state agency site visits for approval
Manure Management Requirements	<ul style="list-style-type: none">• 36 states require manure management plans• 22 states require state approval of facility design plans or other criteria for manure structures• 22 states impose nutrient standards or other limits which restrict manure application• 24 states require groundwater monitoring wells under some circumstances• 28 states allow surface discharges from manure systems under some circumstances
Fees, Financial Assurance, and Training	<ul style="list-style-type: none">• 26 states indicate fees are assessed during the approval process• 8 states impose bonding/financial assurance requirements to pay for closure or clean up costs• 12 states require training programs for manure management/applicators
NOTES: 1. Responses from 48 states to the Animal Confinement Policy National Task Force (1999) state questionnaire. 2. According to the Task Force, survey response have not been verified and the summary tally may under-report incidence of provisions in some states due to non responses for questions judged to be beyond the scope of expertise of the respondents. 3. See Table 4-2 and Appendix B for additional detail regarding state responses.	

Comparison of Regulations

TABLE 4-2
Summary of 48 State Responses to Task Force Questionnaire Regarding Concentration Animal Feeding Operation Siting and Waste Management Practices

State	Site Selection Approval	Waste Management Facility Set-Backs From Water Bodies, Wells, Or Floodplains	State-Required Physical Or Geological Test Requirements For Siting Or Design	State-Required Groundwater Monitoring	State Regulatory Inspection Prior To Approval	Design Plan Or Other Criteria Required For State Approval	Waste Management Plan Required For State Approval	State Limits To Restrict Manure Disposal	State Regulation Of Legal Surface Discharges From Manure Management Systems
Alabama	State and local agency	No response	No	No response	No response	No response	No response	No response	No response
Alaska	State agency	No	No	No	No response	No response	No response	No	No
Arizona	Local agency	No	No	Yes	Yes	No	No	Yes	Yes
Arkansas	State agency	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
California	Local agency	No	No	Yes	No	Yes	Yes	Yes	Yes
Colorado	Local agency	Yes	No	Yes	No	No	No	No	Yes
Connecticut	State and local agency	Yes	No	No	Yes	No	Yes	No	No
Delaware	None	No	No	No	No	No	Yes	No	No
Florida	Federal and state agency	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Georgia	State and local agency	No	Yes	Yes	Yes	Yes	Yes	Yes	No response
Hawaii	State and local agency	Yes	No	No	No	Yes	Yes	No response	Yes
Idaho	State and local agency	No	Yes	No	Yes	Yes	Yes	No	Yes
Illinois	State agency	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Indiana	State and local agency	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Iowa	State agency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Kansas	None	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Kentucky	State agency	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Maine	None	No	No	No	Yes	No	No	No	Yes
Maryland	State and local agency	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Massachusetts	State agency	No	No	No	No	No	No	No	No
Michigan	Local agency	No	No	No	No response	No response	No response	Yes	Yes



<p>TABLE 4-2</p> <p>Summary of 48 State Responses to Task Force Questionnaire Regarding Concentration Animal Feeding Operation Siting and Waste Management Practices</p>									
State	Site Selection Approval	Waste Management Facility Set-Backs From Water Bodies, Wells, Or Floodplains	State-Required Physical Or Geological Test Requirements For Siting Or Design	State-Required Groundwater Monitoring	State Regulatory Inspection Prior To Approval	Design Plan Or Other Criteria Required For State Approval	Waste Management Plan Required For State Approval	State Limits To Restrict Manure Disposal	State Regulation Of Legal Surface Discharges From Manure Management Systems
Minnesota	Federal, state, and local agency	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Mississippi	State and local agency	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Missouri	State agency	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Montana	State and local agency	No response	Yes	Yes	Yes	Yes	Yes	Yes	No
Nebraska	State and local agency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nevada	None	No	No	Yes	No	Yes	Yes	No	Yes
New Hampshire	None	No	No	No	No response	No response	No response	No	No
New Jersey	State agency	No	No	No	No	No	No	No	Yes
New Mexico	Local agency	No response	No	Yes	No	Yes	Yes	Yes	Yes
New York	State agency	No response	No response	No	No response	No response	No response	No	No
North Carolina	State and local agency	Yes	Yes	No	No	Yes	Yes	Yes	Yes
North Dakota	State agency	No	Yes	No	No	Yes	Yes	No	Yes
Ohio	State agency	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Oklahoma	State agency	No	Yes	Yes	Yes	Yes	Yes	Yes	No response
Oregon	State agency	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Pennsylvania	Local agency	No	No	Yes	No	Yes	Yes	Yes	Yes
Rhode Island	State agency	Yes	No	Yes	Yes	No	No	Yes	No response
South Carolina	State agency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
South Dakota	State and local agency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tennessee	State agency	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Texas	State agency	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Utah	State and local agency	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Comparison of Regulations

TABLE 4-2 Summary of 48 State Responses to Task Force Questionnaire Regarding Concentration Animal Feeding Operation Siting and Waste Management Practices									
State	Site Selection Approval	Waste Management Facility Set-Backs From Water Bodies, Wells, Or Floodplains	State-Required Physical Or Geological Test Requirements For Siting Or Design	State-Required Groundwater Monitoring	State Regulatory Inspection Prior To Approval	Design Plan Or Other Criteria Required For State Approval	Waste Management Plan Required For State Approval	State Limits To Restrict Manure Disposal	State Regulation Of Legal Surface Discharges From Manure Management Systems
Vermont	State agency	Yes	Yes	Yes	No response	Yes	Yes	Yes	Yes
Virginia	State and local agency	No	No	Yes	No	Yes	Yes	Yes	No
Washington	State and local agency	No response	Yes	No response	No response	Yes	Yes	No response	Yes
Wisconsin	Local agency	No	No	Yes	No response	Yes	Yes	Yes	No response
Wyoming	State agency	Yes	Yes	No response	No	Yes	Yes	Yes	No
NOTES:									
1. Responses from 48 states to the Animal Confinement Policy National Task Force (1999) state questionnaire.									
2. Summary responses do not indicate full scope of state comments. See Appendix B for full response information.									



4.2 State Environmental and Waste Management Policy Matrix

Colorado State University (Patton and Seidl 1999) compiled three surveys of state regulations into a matrix that subdivided confined animal facility regulations into the following categories: assistance, environmental, health and safety, management tools, waste management, and “other regulations related to CAFOs.” The Patton and Seidl matrix is included in Appendix C and information related to groundwater protection has been synthesized and summarized in Table 4-3. Similar to state responses to the Task Force questionnaire, the Patton and Seidl (1999) matrix shows variation in state requirements intended to provide environmental protection from confined animal waste management facilities. However, the information summarized in Table 4-3 indicates a number of states regulations include requirements important to the protection of groundwater. For example:

- 22 of the 33 states included in the matrix have waste lagoon liner seepage or permeability requirements (4 states have no requirements and no information was provided for 7 states); and
- 25 of the 33 states included in the matrix (including California) have minimum liner material requirements. In contrast to the California requirements, many of the state specifications are based on NRCS Technical Standards and Guidelines (NRCS Standards) and/or require materials to meet quantitative liner permeability or seepage requirements.

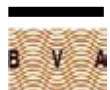
As shown in Table 4-3, most of the regulations included in the matrix pertain to general siting, design, and construction requirements and little information was provided regarding operations, maintenance, and closure of the facilities. Patton and Seidl (1999) do not differentiate regulations that may be specific to retention ponds, corrals, and milk barns.

4.3 Summary of Seven State’s Regulations

Czebiniak, et al. (2003) completed a comprehensive summary of information regarding state regulations covering animal feeding operations in Alabama, Arkansas, Illinois, Indiana, Maryland, Nebraska, and Oregon. Some state regulations operate independently of their respective NPDES programs but all of the states evaluated by Czebiniak, et al. have been delegated authority to administer their NPDES programs by the U.S. EPA. The intent of the summary report was to provide a reasonably accurate comparative assessment of state approaches and standards that regulate animal feeding operations (Czebiniak, et al., 2003). The complete report is included in Appendix D and relevant information to the protection of groundwater is summarized in Table 4-4.

Similar to the information presented in Tables 4-1, 4-2, and 4-3, the information presented in Table 4-4 indicates variation in state requirements for design standards, groundwater and surface water setbacks, testing and site characterization, monitoring, and facility closure.

Table 4-5 presents a comparative summary between California and other state requirements which illustrate this variation with respect to siting, design, construction, operations, maintenance, and closure criteria. As shown in these tables, most of the surveyed states require conformance with NRCS Standards, plan approval by a state agency, subsurface investigations, and animal waste lagoon liner performance requirements that are quantified by maximum seepage rates and/or maximum permeability rates. The seven state's data as summarized by Czebiniak, et al. (2003) do not differentiate requirements that may be specific to corrals and milk barns.



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TABLE 4-3 Summary of Matrix of State Level Policies for Animal Feeding Operations That Relate to Groundwater Protection									
State	Siting Requirements			Design Requirements				Operations & Maintenance Requirements	
	Pre-Development Site Appraisal	Waste Structure Bottom to Groundwater	Soil Borings	Design Standard	Liner Material Required	Allowed Lagoon Seepage or Liner Permeability	Well Construction Requirements	Groundwater Related Programs and Requirements	
Arizona	Yes	Varies	No information	No	NRCS Standards Lined with, or underlain by, soils containing at least 10% clay and not more than 10% gravel	None	Yes	Yes	
California	Yes	County standards	No information	Yes	Any material meeting seepage requirements	No information	Yes	None	
Colorado	None	None	No information	Yes	NRCS Standards	1/32 in./day	Yes	Yes	
Connecticut	Yes	2 to 4 feet	No information	Yes	NRCS Standards	No information	Yes	Yes	
Delaware	None	Case-by-case	No information	Yes/NRCS	No Standards	1 in./yr or 1x10 ⁻⁷ cm/sec	Yes	Yes	
Georgia	Yes	None	No	Yes/NRCS	Compacted clay or synthetic	1/8 in./day	Yes	No information	
Idaho	None	2 feet	No information	Yes	2 feet compacted soil, concrete, asphalt, or synthetic	1/8 in./day	Yes	Yes	
Illinois	None	Varies	No	Yes/NRCS	Compacted clay to meet permeability requirement or synthetic	1x10 ⁻⁷ cm/sec	Yes	Yes	
Indiana	Yes	Uncertain	2 feet below bottom of lagoons	Yes	2 feet compacted clay or synthetic	No information	None	Yes	

Comparison of Regulations

TABLE 4-3
Summary of Matrix of State Level Policies for Animal Feeding Operations That Relate to Groundwater Protection

State	Siting Requirements			Design Requirements				Operations & Maintenance Requirements
	Pre-Development Site Appraisal	Waste Structure Bottom to Groundwater	Soil Borings	Design Standard	Liner Material Required	Allowed Lagoon Seepage or Liner Permeability	Well Construction Requirements	
Iowa	Yes	Varies	3 borings minimum, depth varies below lagoons	Yes	Any material meeting seepage requirements	1/16 in/day	Yes	No information
Kansas	No information	No information	No	No information	No information	1/4 in/day	No information	No information
Kentucky	None	No information	No	None	No information	No information	No information	No information
Louisiana	Case-by-case	Varies	No information	Yes	Compacted clay to meet permeability requirement or NRCS Standards	1×10^{-7} cm/sec	Yes	No
Maine	Recommended	Uncertain	No information	Yes	Site-specific BMPs	No information	Yes	None
Michigan	Yes	NRCS Standards	No	Yes/NRCS	NRCS Standards	NRCS Standards	Yes	Yes
Minnesota	Yes	2 feet	2 minimum	No	Any material meeting seepage requirements	500 gal/ac/dy	Yes	Case-by-Case
Missouri	Yes	4 feet	No Information	Yes	Compacted clay or synthetic	Varies, 500 to 3,500 gal/ac/dy	Yes	Yes
Nebraska	No Information	No Information	No	No Information	No Information	$\frac{1}{4}$ in/day	No Information	No Information
New Jersey	Yes	None	No Information	Yes	NRCS Standards	None	Yes	Yes
New Mexico	Yes	Case-by-case	No Information	Yes	Compacted clay or synthetic	1×10^{-7} cm/sec	Yes	Yes
New York	No	None	No Information	Yes/NRCS	No Standards	None	No	Yes
North Carolina	Yes	None	NRCS Standards	Yes	Any material meeting seepage requirements	1/28 in/day	Yes	No Information
Ohio	No Information	No Information	Yes	No Information	No Information	No Information	No Information	No Information



TABLE 4-3

Summary of Matrix of State Level Policies for Animal Feeding Operations That Relate to Groundwater Protection

State	Siting Requirements			Design Requirements				Operations & Maintenance Requirements
	Pre-Development Site Appraisal	Waste Structure Bottom to Groundwater	Soil Borings	Design Standard	Liner Material Required	Allowed Lagoon Seepage or Liner Permeability	Well Construction Requirements	
Oklahoma	Yes	4 feet	No Information	Yes	Soil or geomembrane	1×10^{-7} cm/sec or NRCS TN 716 rates	Yes	Yes
Oregon	Yes	None	No Information	Yes	Case-by-case	1×10^{-7} cm/sec	No	Yes
Pennsylvania	Yes	Varies	No	Yes/NRCS	NRCS Standards	NRCS TN 716 rates	No	Yes
South Dakota	No Information	No Information	No Information	No Information	No Information	1/8 in/day	No Information	No Information
Tennessee	No	No	No Information	No	No Standards	None	No	No
Texas	Case-by-case	Varies	No Information	Yes	NRCS TN 716	No Information	Yes	Yes
Vermont	No	No	No Information	Yes/NRCS	NRCS Standards	NRCS Standards	No Information	Yes
Virginia	Yes	No	No Information	No	Compacted clay or synthetic	1×10^{-7} cm/sec	No Information	No
Wisconsin	Yes	>3 feet	Yes	Yes/NRCS	Clay, concrete, steel, geomembrane	1×10^{-7} cm/sec	No Information	Yes
Wyoming	No	No	No Information	Yes	"Must protect groundwater"	Varies	No Information	Yes

NOTES:

1. Responses synthesized from Patton and Seidl (1999). See Appendix C for complete survey results.

Comparison of Regulations

TABLE 4-4
Comparison of Confined Animal Facility Applicable Laws, Threshold Limits, and Permit Overview for Seven States

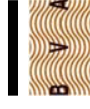
State	Design Standards	Setbacks from Surface and Groundwater	Geophysical, Land, and Soil Requirements	Monitoring Requirements	Closure Requirements
Alabama	<ol style="list-style-type: none"> 1. NRCS Technical Standards and Guidelines 2. Plans must be approved by ADEM 	<ol style="list-style-type: none"> 1. 100 feet from a stream 2. 500 feet from a potable water well 3. 200 feet from a perennial water course 4. No well within 200 feet of waste structure 	<ol style="list-style-type: none"> 1. Cannot be built over site with direct hydraulic connection to groundwater 2. Must perform subsurface investigation 3. Must extend at least 2 feet below planned bottom grade 4. Detailed investigation required for karst topography 5. Conformance with NRCS technical standards and guidelines to ensure the protection of groundwater 	<ol style="list-style-type: none"> 1. Sufficient to ensure facility meets or exceeded NRCS Standards 2. State may require groundwater evaluation or monitoring 3. All investigation or monitoring must be under plans prepared by professional engineer or geologist 	<ol style="list-style-type: none"> 1. Closure Plan required 2. COA Plan required to meet NRCS Standards
Arkansas	<ol style="list-style-type: none"> 1. NRCS Standards 2. Plans must be approved by ADEQ 	<ol style="list-style-type: none"> 1. No specific requirements for water bodies or groundwater 	<ol style="list-style-type: none"> 1. Subsurface investigation required for earth holding ponds, treatment lagoons, and liner requirements 2. Must extend at least 2 feet below planned bottom grade 	<ol style="list-style-type: none"> 1. No general monitoring provisions 2. Requires wastewater and soil sampling 	<ol style="list-style-type: none"> 1. Closure Plan required 2. Certification of closure required
Illinois	<ol style="list-style-type: none"> 1. ASAE¹ design guidance or NRCS Standards 2. Plans must be approved by IDOA and ILCS 3. Certification of construction in accordance with standards required 	<ol style="list-style-type: none"> 1. No stream or surface water body within facility boundary 2. No other specific requirements for water bodies or groundwater 	<ol style="list-style-type: none"> 1. Must be designed to prevent seepage of stored materials into groundwater in karst areas or where groundwater is within 5 feet of bottom of the facility 	<ol style="list-style-type: none"> 1. No general monitoring provisions 2. Groundwater monitoring required if aquifer is within 20 feet of lagoon bottom 3. Three wells (minimum) required 	<ol style="list-style-type: none"> 3. Earthen waste lagoons must be emptied and the hold filled
Indiana	<ol style="list-style-type: none"> 1. Approval based on site-specific information 2. Additional design standards may be imposed if necessary to protect human health and the environment 	<ol style="list-style-type: none"> 1. 1,000 feet from public water supply well 2. 300 feet from surface water and off-site water wells 3. 100 feet from on-site water wells 4. 100 feet setbacks for all manure storage structures 	<ol style="list-style-type: none"> 1. 2 feet minimum freeboard for liquid manure storage 2. Emergency spillway required 3. Earthen structures must be certified by professional engineer 4. Seepage rate less than 1/16 in/day 5. May not be constructed in sand or gravel soils unless approved liner system 6. Plans must be approved by IDEM 	<ol style="list-style-type: none"> 1. No general groundwater monitoring requirements 2. IDEM may impose monitoring on case-by-case basis 	<ol style="list-style-type: none"> 1. No closure requirements identified
Maryland	<ol style="list-style-type: none"> 1. Must comply with BMPs 2. NRCS Standards 3. Waste Management Plan must be certified by Soil Conservation District 	<ol style="list-style-type: none"> 1. No specific requirements for water bodies or groundwater 	<ol style="list-style-type: none"> 1. Earthen embankments must be inspected weekly for structural stability 2. Lagoon bottoms and inner slopes must be lined with impervious material to preclude pollution of groundwater by seepage 3. Permeability of the liner must be 10^{-7} cm/sec or less with a minimum thickness of 2 feet 	<ol style="list-style-type: none"> 1. Groundwater monitoring required if groundwater quality likely to be impacted 2. Two monitoring wells (minimum) required 3. Analytical requirements specified 	<ol style="list-style-type: none"> 1. No closure requirements identified



<p>TABLE 4-4 Comparison of Confined Animal Facility Applicable Laws, Threshold Limits, and Permit Overview for Seven States</p>					
State	Design Standards	Setbacks from Surface and Groundwater	Geophysical, Land, and Soil Requirements	Monitoring Requirements	Closure Requirements
Nebraska	<ol style="list-style-type: none"> 1. Specific Nebraska siting, design, and construction requirements 2. Owner and designer must certify construction pursuant to requirements 	<ol style="list-style-type: none"> 1. 100 feet from any well used for domestic purposes (exceptions allowed) 2. 100 feet from off-site well used for human consumption (no exceptions) 3. 1,000 feet from public drinking water supply well (exceptions allowed) 4. More than 4 feet above groundwater level (exceptions allowed) 	<ol style="list-style-type: none"> 1. Not allowed in watershed that feeds directly or indirectly to cold water stream 2. More than 4 feet above highest groundwater 3. Permit application must include construction quality assurance plan 4. Permit application must include description of methods to be implemented to insure the facility is constructed in accordance with applicable design criteria. Must include soil liner testing, geotechnical reports, design calculations, and closure plan. 5. Liners may not use manure amendments to meet percolation requirements 6. Percolation rates vary from 0.25 in/day to 0.13 in/day depending on classification 7. Inspection requirements for slope stability 8. Properly compacted subgrade (6 in min) must be below synthetic liner systems 9. Facilities at or below seasonal high groundwater must have 1 foot (min) liner with conductivity 10⁻⁷ cm/sec or less 	<ol style="list-style-type: none"> 1. Groundwater monitoring may be required depending of class of facility and subsurface conditions 2. Where required, 3 wells (minimum) must be installed 	<ol style="list-style-type: none"> 1. Closure Plan required
Oregon	<ol style="list-style-type: none"> 1. Oregon-specific guidelines 2. Guidelines are considered recommendations that convey criteria considered by Oregon to conform to best practicable design and operational practices 	<ol style="list-style-type: none"> 1. 50 feet from water supply well (exceptions allowed) 2. Facilities located such that manure, contaminated drainage waters or other wastes do not enter waters of the state. 	<ol style="list-style-type: none"> 1. No specific requirements outside of the Oregon Guidelines 2. Approval requires information on groundwater and soil types in facility area 	<ol style="list-style-type: none"> 1. Groundwater management may be required if high nitrate or other contaminant levels are found 	<ol style="list-style-type: none"> 1. No closure requirements
<p>¹ASAE – American Society of Agricultural Engineers "Design of Anaerobic Lagoons for Animal Waste Management."</p>					

Comparison of Regulations

Table 4-5 Comparative Summary of California Title 27 Confined Animal Facility Regulations with Regulations from Seven Other States															
Jurisdiction	Siting			Design			Construction	Maintenance							
	Setback	Geologic Setting	Flooding	5-Foot Separation	Unit Foundation	Pond Liner or Permeability Requirement	Storage Capacity Limits/Requirements	Government Approval	Groundwater Monitoring	Odor & Air Standards	Discharges & Emergency Planning & Reporting	Run-on/Run-off Control Systems	Surface Water Requirements	Reporting & Record Keeping Requirements	General Best Management & Housekeeping Practices
California			X						X		X	X	X		X
Alabama	X	X	X			X	X	X	X	X	X	X		X	X
Arkansas	X		X				X	X		X	X				
Illinois	X	X	X	X	X	X	X	X	X	X	X	X			
Indiana	X		X	X			X	X	X		X		X	X	X
Maryland	X		X	X	X	X	X	X	X		X		X	X	X
Nebraska	X	X		X		X	X	X	X	X	X				X
Oregon	X	X				X		X	X	X	X		X		X
Regulations															
Jurisdiction	Operational						Closure								
	Filing and Maintenance of Plans	Sludge Removal	Waste Loading	Treatment Period	Excavations	Operating Levels	Closure	Financial Assurance							
California															
Alabama	X	X	X	X	X	X	X	X	X	X		X			
Arkansas	X											X			
Illinois	X	X	X	X		X	X	X	X	X		X		X	
Indiana	X														
Maryland	X	X	X			X		X		X					
Nebraska	X					X									
Oregon	X														



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Section 5

Local Requirements

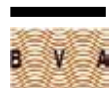
Local confined animal facility requirements are frequently implemented at the county level through Conditional Use Permits (CUP) that may or may not include restrictions specific to corrals, barns, and retention ponds or have restrictions on siting, design, construction, operations, maintenance, monitoring, or closure. Recent changes to the Kings County General Plan (Kings County Planning Agency 2002) and the Merced County Animal Confinement Ordinance (Merced County 2002) include updates to local requirements intended to protect human health and the environment.

5.1 Dairy Element of the Kings County General Plan

The Dairy Element of the Kings County General Plan contains policies and programs designed to: (1) ensure that the dairy industry of Kings County continues to grow and contribute to the economic health of the county; and (2) ensure that the standards established in the Dairy Element protect public health and safety and the environment. Part of the strategy to accomplish these objectives is to set a limit on the number of cows that can be accommodated in Kings County. However, Kings County acknowledges that a simple head count with assumptions about average waste production per animal unit does not address the environmental site differences. Site differences include different methods of herd management, dairy process water and manure management, soil types, groundwater and surface water conditions, crop production management, and the proximity of receptors. All of these elements affect the ability of a facility to reduce or eliminate adverse environmental effects (Kings County Planning Agency 2002). As a result, each application for a new or expanded dairy must include a “Technical Report” that addresses components pertaining to the protection of groundwater. These components include a geotechnical report, groundwater evaluation, soils evaluation, hydrologic sensitivity assessment (HSA), gas and oil well evaluation, and manure nutrient management plan (MNMP).

The principal requirements of the Dairy Element and Technical Report plans are summarized in Table 5-1. As identified in this table, the requirements generally intended to protect surface and groundwater include:

- Conformance with NRCS Standards;
- Minimum separation of five feet from the highest anticipated groundwater level;
- Maximum waste lagoon liner permeability requirement of 1×10^{-6} cm/sec;
- Static and seismic slope stability requirements for embankments;
- Pre-construction inspection, design, and testing requirements for waste lagoons and ponds; and
- Post-construction certification and inspection requirements.



The Dairy Element also requires that corrals and dry manure storage areas be underlain by naturally occurring or imported clayey soils with not less than 20 percent clay and silt. In addition, there must be regular maintenance of corrals and dry manure storage areas including the filling of depressions and care must be taken not to disturb the seal layer in the corrals.

5.2 Merced County Animal Confinement Ordinance Revision

Merced County recently revised its Animal Confinement Ordinance (Ordinance) to reflect current scientific understanding regarding confined animal facilities. The revisions to the Ordinance are intended to ensure that the dairy industry in the county operates at an environmentally sustainable level (Merced County 2002). The Ordinance requires all dairies, existing and new, to complete and implement a Comprehensive Nutrient Management Plan (CNMP) by December 31, 2006. The CNMP “would reduce the volume of water and air pollutants committed irreversibly and irretrievably to non-beneficial uses, that is, infiltrating to and contaminating groundwater, discharging and contaminating surface waters, and emissions to and contaminating air” (Merced County 2002).

The CNMP is similar to the Technical Report required by Kings County and is required before the applicant obtains a building permit for a new facility, significantly expands or modifies the operation of an existing facility, or constructs a retention pond or settling basin. General CNMP content includes:

- A description of dairy facilities, including number of animals, dimensions of retention ponds and settling basins, facility maps, and manure management systems;
- A determination of balance of wastewater/manure application rates to crops, dairy nutrient load calculations (liquid and dry), manure/wastewater application rates, and underlying soil types;
- The results of annual mandatory wastewater, dry manure, and soil sampling; and
- The results of groundwater or plant tissue monitoring (if required).

The Ordinance also incorporates the NRCS (1997b) pond construction standards and specifies a maximum liner permeability of 1×10^{-6} cm/sec. Merced County notes that in most cases, implementation of the NRCS guidelines will provide a lower pond discharge rate than that provided by the Title 27 minimum standard of at least 10 percent clay and no more than 10 percent gravel. Merced County Ordinance requirements for retention ponds, settling basins, manure storage area setbacks, closure requirements, storage area surfaces, and corral slopes are summarized in Tables 5-2 and 5-3.

Comparison of Regulations

TABLE 5-1 Summary of Kings County Dairy Element Technical Report Content Requirements		
Component	Description	Contents
Geotechnical Report	<p>The geotechnical report is a part of the Technical Report documentation prepared by a qualified professional, either a Professional Engineer or Licensed Geotechnical Engineer, and shall be submitted to the Kings County Planning Agency with the Site Plan Review (SPR) or CUP application. The report shall, at a minimum, present the results of sufficient subsurface sampling and testing to classify and characterize the soils and groundwater conditions in areas of proposed dairy facility structures, corrals, feed and manure storage areas, lagoon, and cropland where process water and manure are spread. The report shall include recommendations for foundation design, cut and fill slope design, berm or embankment design, and site grading.</p>	<p>The recommendations shall specifically address, but are not limited to, the following:</p> <ul style="list-style-type: none"> A. Soil consolidation and compression; B. Shrink-swell potential; C. Soil corrosivity; D. Cut and fill slope stability under static and pseudo-static (earthquake) conditions; E. Erosion potential <p>Prior to construction of a proposed above-grade embankments for the manure separation pits and process water lagoons at a dairy facility, the owner/operator shall submit a revised geotechnical report, prepared by a qualified professional that presents any changes to the specifications for the construction of embankments, foundations, cut and fills using on-site surface soils. The geotechnical report shall be submitted to the Kings County Building Department and shall include at least the following requirements:</p> <ul style="list-style-type: none"> A. Specific compaction testing requirements that ensure suitable compressive strength for the embankments. The compaction requirements shall specifically address the potential for leaching of salts and possible effects associated with hydrocompressibility of the emplaced soils. B. Slope stability analysis for proposed embankment design. The slope stability analysis shall demonstrate that, under proposed design and requirements for fill compaction, the fill slopes will have a factor of safety of 1.25 or greater under static conditions and 1.0 or greater under pseudo-static (expected seismic shaking) conditions. <p>Following Construction:</p> <ul style="list-style-type: none"> A. Following construction of lagoons and separation pits, a registered Civil Engineer or licensed Geotechnical Engineer shall submit to the Kings County Planning Agency documentation and certification that the embankments have been constructed in compliance with design requirements. The documentation and certification shall also be maintained on the dairy site and be made available to Code Compliance personnel upon request. B. Following construction of lagoons and separation pits, a registered Civil Engineer or licensed Geotechnical Engineer shall submit to the Kings County Planning Agency documentation and certification that the bottoms and sides of the lagoons and separation pits has a permeability equal to, or less than, 10^{-6} cm/sec. The documentation and certification shall be maintained on the dairy site and be made available to Code Compliance personnel upon request. C. Annual inspection and reporting of findings by a Registered Civil Engineer or licensed Geotechnical Engineer of the inspection of the lagoons and separation pits, and any remedial action taken.



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TABLE 5-1 Summary of Kings County Dairy Element Technical Report Content Requirements		
Component	Description	Contents
Groundwater Evaluation	This evaluation may be done in conjunction with the geotechnical report described above.	<p>Technical Report shall address the following:</p> <p>A. Depth to first groundwater: Minimum separation from bottom of (lined and unlined) lagoons, manure and feed storage areas, and corrals shall be at least five (5) feet to the highest recorded groundwater level.</p> <p>B. Depth to first useable groundwater for human consumption: The source of potable water for the dairy facility and nearby properties, and the safeguards to protect that water source must be identified.</p> <p>C. Proximity to watercourses: Adjacent watercourses and improvements to protect watercourses from discharges from a dairy into watercourses or water bodies must be identified.</p> <p>Documentation of the above information shall be submitted to the Kings County Planning Agency with the SPR or CUP application and maintained on the dairy site and be made available to Code Compliance personnel upon request.</p> <p>In the event there is a variance between these standards and the RWQCB requirements, the RWQCB standard will then prevail.</p>
Soils Report	The applicant for new dairies, or the expansion of existing dairies, shall file as part of the Technical Report a preliminary soils report on the Dairy Facility prepared by a Registered Civil Engineer.	<p>The preliminary soils report shall be based upon sufficient subsurface sampling and testing to classify and characterize the soils using test borings or excavations necessary to evaluate the soil beneath the proposed dairy facility. If the preliminary soils report indicates the presence of critically expansive soils or other soil problems, which if not corrected, could lead to structural defects or leakage of contaminants into the groundwater, a soil investigation shall be prepared by a Civil Engineer registered in the State of California and shall recommend design requirements that are likely to prevent possible structural damage to structures or lagoons proposed to be constructed within the dairy facility. The report shall include recommendations for foundation design, cut and fill slope design, and site grading</p> <p>The HSA shall include the following:</p>
Hydrogeologic Sensitivity Assessment	Whenever groundwater is being pumped from a hydrogeologic setting within one-half (½) mile of a proposed or an expanding dairy facility underlain by karst, fractured bedrock, or gravel, the applicants shall retain a qualified Certified Hydrogeologist or Professional Engineer to conduct a HSA.	<p>A. The HSA shall evaluate whether the hydrogeologic setting would offer adequate barriers to pollutant migration to drinking water supplies. The evaluation shall be conducted in accordance with the principles contained in the U.S. EPA's Ground Water Rule.</p> <p>B. Dairies proposed in the Kettleman Plain or Sunflower Valley: In addition to paragraph A above, dairies proposed in these areas must complete an HSA to demonstrate that an adequate sustainable water supply would be available for each proposed project. The HSA must provide a detailed description of the proposed project water demand and how that demand would be met without overdrafting groundwater supplies. If the project proposes use of groundwater supplies, the HSA must quantify the safe yield of the underlying aquifer. Allowable groundwater use must be limited to the quantified safe yield.</p>
Gas and Oil Well Evaluation	The Technical Report shall include a report that the California Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR) has reviewed their records for the potential presence of active and abandoned oil or	<p>if DOGGR identifies wells, the Technical Report shall include a scaled map showing the location of the wells on the Site Plan of the proposed dairy facility. Any abandoned oil or gas wells identified by DOGGR within the proposed dairy site located beneath or within 300 feet of a proposed dairy structure shall be properly closed in accordance with specifications provided by DOGGR. Documentation of any well closure or destruction pursuant to DOGGR standards, or other protection deemed adequate by DOGGR, shall be submitted to the Kings County Planning Agency.</p>

TABLE 5-1 Summary of Kings County Dairy Element Technical Report Content Requirements		
Component	Description	Contents
	gas wells at or adjacent to (within 100 ft) a proposed dairy site.	<p>The MNMP includes the following components as found in the USDA/U.S. EPA Unified National Strategy for Animal Feeding Operations:</p> <p>A. Feed Management – Evaluate the possibility of modifying diets and feed of the animals to reduce the amounts of nutrients in manure.</p> <p>B. Manure Handling and Storage – Manure must be handled and stored properly to prevent water pollution from dairies. Manure and dairy process water handling and storage practices shall consider odor and other environmental and public health problems. Handling and storage considerations shall include:</p> <ol style="list-style-type: none"> 1. Diversion of clean water – Dairy siting and management practices may include diverting clean water from contact with corrals, pens, freestalls, feeding lanes and areas, feed storage areas, interiors of barns and milking parlors, manure storage and handling areas, dead animal storage areas, and other areas exposed to manure, feed, or dead animals. Clean water includes rainfall falling on roofs of facilities and runoff from adjacent lands, or other sources. If clean water is not diverted from manured areas, the capacity of process water storage facilities (i.e., lagoons) shall be sufficient to collect the additional runoff. 2. Prevent leakage – Construction and maintenance of buildings, collection systems, conveyance systems, and storage facilities shall prevent releases of organic matter, nutrients, and pathogens to ground or surface water by implementing the following measures: <ol style="list-style-type: none"> a. All manure separation pits and process water lagoons shall be constructed so that the bottoms of the pits and lagoons are at least five feet above the highest expected groundwater levels. b. The pits and lagoons shall be maintained so that the integrity of the seal is ensured. c. The specific discharge of process water through the soils lining the bottom and sides of the manure separation pits and lagoons shall not be greater than 1×10^{-6} centimeters per second in compliance with the Geotechnical, Design, and Construction Guidelines published by the Natural Resource Conservation Service (1997). d. A qualified professional (i.e., Professional Engineer or Certified Engineering Geologist) shall certify that the liner system of a lagoon or pit is installed according to the NRCS Standards (design). e. The soil sampling and permeability testing program shall be designed to be representative of all soils lining all proposed pond areas. f. Construction of the lagoons shall be inspected by a qualified professional to ensure that geologic heterogeneities (e.g., channel deposits and sandy lenses) are identified and properly mitigated to ensure integrity of the liner in compliance with the NRCS Standards. The liner must be protected against damage during
Manure Nutrient Management Plan	The MNMP is a part of the Technical Report submitted with each application to either establish a new dairy or expand an existing dairy. The MNMP specifies practices that will be used to implement each component of the MNMP.	

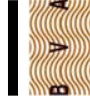


TABLE 5-1 Summary of Kings County Dairy Element Technical Report Content Requirements		
Component	Description	Contents
		<p>operation and maintenance activities.</p> <p>g. At the corrals, naturally occurring or imported clayey (not less than 20 percent clay and silt) soils shall underlie the corrals and dry manure storage areas. Site drainage shall be included in the project design and construction of any manured area, including but not limited to, dairy surroundings, corrals, and ramps, pursuant to Title 3, Division 2, Chapter 1, Article 22, §646.1 of the California Code of Regulations to ensure that ponding does not occur.</p> <p>h. Regular maintenance of corrals and dry manure storage areas shall include filling of depressions. Care shall be taken not to disturb the seal layer in the corrals. Dairy personnel shall be taught to correctly use manure collection equipment.</p> <p>i. The potential for discharge of water-borne pathogens to existing and proposed domestic water supply wells shall be minimized by ensuring that the domestic wells are constructed in accordance with the California Well Standards and that appropriate minimum setbacks (150 feet, or other distance set in the Waste Discharge Requirements issued for the dairy by the RWQCB) between domestic wells and potential sources of pollution are maintained.</p> <p>3. Provide adequate storage for manure:</p> <p>a. Dry manure shall be stored in a manner to ensure all runoff from the manure storage areas is captured and diverted to the dairy process water collection system.</p> <p>b. Dairy process water storage systems shall be designed and constructed to store, handle, and transport all of the quantity and contents of dairy process water produced on the Dairy Facility, runoff from the Dairy Facility, and rainfall that falls on the Dairy Facility. Location of manure storage areas shall be consistent with Policy DE 3.2c.</p> <p>4. Manure treatments - Manure shall be treated to reduce the loss of nutrients to the atmosphere during storage, to make the material a more stable fertilizer when land-applied or to reduce pathogens, vector attraction and odors, as appropriate.</p> <p>C. Management of dead animals – A Dead Animal Management Plan (DAMP) shall be prepared and implemented for the disposal of all dead animals in a way that does not adversely affect groundwater or surface water, create public health concerns, or cause nuisances due to odor or vectors.</p>
NOTES: 1. Technical Report contents from Kings County Planning Agency (2002)		

TABLE 5-2
Summary of Merced County Animal Confinement Ordinance
General Requirements Related to Water Quality

SECTION	REQUIREMENT
7.13.040 E.	All contaminated storm water drainage water that is or has been in contact with manure and wastewater shall be maintained on-site and directed to the manure management system or on to properties with a signed written agreement between the owner of the animal confinement facility and property owner receiving the manure. All grading operations on the property shall result in no storm drainage or wastewater being allowed to flow or seep onto adjacent properties or public roads, or into any waterway.
7.13.040 G.	The operator shall notify the Division of Environmental Health and Regional Board within 24 hours of any off-property discharge of facility wastewater. This notification will be followed by a written report that shall be submitted to the Division of Environmental Health within 14 days of the discharge.
7.13.040 K	Neither the storage nor the discharge of manure shall create a condition of nuisance or pollution as defined by Section 13050 of the California Water Code.
7.13.040 M.	New and existing structures shall have gutters to prevent rainwater from entering corrals or areas of manure storage unless adequate storage capacity for the additional rainwater is provided in the retention pond.
7.13.040 N.	Each animal confinement facility shall conduct the following routine inspections and maintenance of the facility. (1) Between November through April, all channels that convey storm water such as roof gutters, shall be free of debris that could interfere with the diversion of clean storm water. (2) All storm water channels that convey contaminated storm water to manure storage and waste containment structures are properly constructed and free of debris, thereby ensuring that contaminated storm water reaches the storage or waste containment structure. (3) Water lines providing drinking water to the animals shall be free of leaks that could contribute an unnecessary volume to liquid storage systems or cause dry manure to become too wet. (4) Retention ponds and settling basins shall be visually inspected for: seepage, erosion, vegetation, animal access and reduced freeboard. Any deficiencies found as a result of these inspections shall be expeditiously corrected. Records of inspection activities shall be kept in the CNMP.
7.13.040 O.	Manure (liquid or dry) shall not be applied, stored or accumulated within 100 feet of any domestic well, irrigation well or surface water body. Application of manure (liquid or dry) may be closer than 100 feet to a surface water body or irrigation well if adequate protection to the surface water body or irrigation well is provided. Surface water bodies include creeks, streams, lakes and reservoirs but does not include canals constructed above grade. Adequate protection of surface water bodies or irrigation wells shall prevent discharge or infiltration of manure constituents to the water body or well.
7.13.040 R.	If an animal confinement facility is permanently closed, all liquid and dry manure must be removed from the facility within 120 days (weather conditions permitting) and soil samples taken beneath the retention pond, settling basin and corral areas to determine the levels of nitrogen in the soil. The specific constituents to be sampled, number of samples and sample depths will be determined by the Division of Environmental Health on a site-specific basis.
7.13.040 T.	When groundwater pollution or the discharge of manure from the operation of an animal confinement facility or application area causes groundwater to



TABLE 5-2
Summary of Merced County Animal Confinement Ordinance
General Requirements Related to Water Quality

SECTION	REQUIREMENT
	contain manure constituents in concentrations statistically greater than background water quality the property owner shall submit a plan for review and approval to the Division of Environmental Health for: (1) Determining the source and the lateral and vertical extent of the degradation. (2) Identifying steps to prevent further degradation. (3) Abating the groundwater impacts (if necessary). Statistical concentrations greater than background will be determined statistically evaluating groundwater monitoring results in monitoring wells down gradient of potential sources relative to background groundwater quality as represented by monitoring wells upgradient of potential sources.
7.13.040 Z.	Manure solids shall be stored on impervious surfaces and protected from storm water run-on. Corrals are excluded from this requirement.
7.13.040 AA.	Manure shall be removed from corrals at least two times per year (Spring and Fall) and freestall exercise pens at least once per year.
7.13.040 DD.	Manure removed from the bottom of a settling basin or retention pond shall be analyzed at a frequency determined by the Division of Environmental Health for total dissolved solids, total nitrogen and other constituents as determined by the Division of Environmental Health.
7.13.040 EE.	Where the commingling of water containing manure can take place with irrigation wells and irrigation and/or drainage district facilities, these facilities must be protected from pollution by a backflow device or method that is approved by the Div. of Environmental Health and/or the appropriate irrigation/drainage district. It is the obligation of the property owner to install and maintain or cause to be installed or maintained the backflow device or method. This also applies to off-property parcels receiving water containing manure under agreement.
7.13.040 FF.	Salt and other mineral feed supplements shall be limited to that required to maintain animal health and optimum production according to the National Research Council.
7.13.040 JJ.	Corrals shall have a slope of at least 3% where the available space for each animal is 400 square feet or less. The slope in areas more than 400 sq. ft. per animal may be reduced proportionately to not less than 1 ½ % at 800 sq. ft. per animal and drain to the waste management system.
7.13.040 LL.	Tile drainage discharges from liquid manure application areas, corrals, retention ponds, settling basins, or feed storage areas shall be: 1) discharged into the animal confinement facility liquid management system or 2) the tile drainage water discharged off-site shall be monitored for total dissolved solids, nitrate, selenium and any other constituents as determined by the Division of Environmental Health and/or the appropriate irrigation/drainage district.
7.13.040 MM.	The off-site discharge of tailwater or tile drainage water shall meet the discharge and receiving water standards of the appropriate irrigation or drainage district and/or Regional Water Quality Control Board.
7.13.040 NN.	Silage storage areas shall be constructed of impervious materials to prevent groundwater degradation with leachate drainage conveyed to the wastewater collection system. Silage storage areas shall be protected from storm water run-on.

TABLE 5-3 Summary of Merced County Animal Confinement Ordinance Requirements for Retention Ponds and Holding Basins	
SECTION	REQUIREMENT
7.13.050 A.	The total retention pond(s) and settling basin(s) capacity shall be designed and constructed for at least a 120-day storage capacity for liquid manure generated at the facility and a 25-year, 24-hour storm. The retention pond/settling basin capacity shall also be adequate to store tail or tile drainage water (if returned to the retention pond/settling basin) and liquid manure to assure that the timing of the land application is appropriate for the nitrogen needs of the crop.
7.13.050 B.	The retention pond(s) and settling basin(s) shall be surrounded by a road at least 14 feet wide and suitable for safe passage of vector control vehicles and equipment. The road should be accessible at all times to provide for the use of vehicle-mounted mosquito control equipment.
7.13.050 C.	The inside banks of all pits, sumps, retention ponds and settling basins shall be maintained free of vegetative growth in order to prevent a breeding habitat for mosquitoes or other vectors.
7.13.050 D.	Retention ponds and settling basins shall be constructed according to the USDA, Natural Resource Conservation Service guidelines, specifically, USDA National Engineering Handbook, Part 651 – Agricultural Waste Management Field Handbook, Appendix 10D – Geotechnical, Design, and Construction Guidelines effective at the time of construction and shall comply with the additional design criteria contained in this chapter.
7.13.050 E.	The bottom of the retention pond and settling basin, including liner, shall be at least two (2) feet above the highest anticipated groundwater table. In sensitive groundwater areas, the separation shall be at least 5 feet unless a synthetic liner approved by the Division of Environmental Health, is constructed.
7.13.050 F.	A retention pond or settling basin must maintain a minimum 1,000 foot separation from any existing residence on adjacent property. For an existing facility that is less than 1,000 feet from an off-site residence, modifications to the facility shall not decrease the existing distance between the off-site residence and the facility.
7.13.050 G.	The property owner shall apply for and obtain a permit from the Division of Environmental Health prior to the construction of a new or modified retention pond and/or settling basin. An inspection and approval of the retention pond by the Division of Environmental Health is required prior to discharging into the retention pond or settling basin.
7.13.050 H.	The liner of the retention pond or settling basin shall be designed and constructed with a permeability of 1×10^{-6} cm/sec or less. The minimum design standard of 1×10^{-6} cm/sec shall not include credit for sealing of the retention pond or settling basin by manure. USDA-NRCS criteria specifically, USDA National Engineering Handbook, Appendix 10D-Geotechnical, Design, and Construction Guidelines, shall be utilized to determine compliance with the 10^{-6} cm/sec sealing standard.
7.13.050 I.	Plans for retention ponds and settling basins shall be designed and signed by a California-registered civil engineer or a California-registered engineering geologist and shall have a maintenance plan approved by the Division of Environmental Health. As-built drawings, signed by a California-registered civil engineer or a California-registered engineering geologist certifying the retention pond/settling basin was constructed as designed, are required to be submitted to the Division of Environmental Health within 30 days of completion of the retention pond or basin.

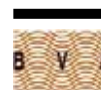


TABLE 5-3 Summary of Merced County Animal Confinement Ordinance Requirements for Retention Ponds and Holding Basins	
SECTION	REQUIREMENT
7.13.050 J.	Settling basins shall not exceed 60 feet in width and retention ponds shall not exceed 100 feet. in width, unless approved by the Merced County Mosquito Abatement District.
7.13.050 K.	Any liner installed by importing soil shall have a thickness of at least one (1) foot.
7.13.050 L.	Natural and constructed liners shall be protected from the erosive forces of waste liquid entering the pond or settling basin and damage due to cleaning operations and scour due to agitation equipment.
7.13.050 M.	Retention ponds and settling basins located near an irrigation or drainage district facility must maintain a minimum 50-foot separation between the outside toe of the retention pond or settling basin bank and the nearest irrigation district facility (either physical facility or right-of-way), and maintain a drainage area between the two facilities that will ensure that all water generated on the animal confinement facility is maintained on site.
7.13.050 N.	Retention ponds, settling basins and ditch conveyances must maintain a minimum 50-foot separation from the ultimate public road right-of-way.
7.13.050 O.	A minimum 20 foot separation must exist between the outside toe of the retention pond or settling basin bank and the facility property boundary.
7.13.050 P.	A retention pond must have a marker on the inside slope which clearly indicates the design volume and minimum freeboard necessary to allow for the 25-year, 24-hour rainfall event. A minimum of two (2) feet of freeboard is required for new and existing retention ponds.
7.13.050 Q.	Retention ponds and settling basins shall be protected against 100-year stream flows.
7.13.050 R.	New and existing retention ponds and settling basins shall not create obnoxious odors, excessive vector breeding or create a condition of nuisance or pollution as defined by §13050 of the California Water Code.
7.13.050 S.	New facilities shall install a flow meter and associated plumbing on the effluent line from the retention pond or describe how flow rates to application fields will be determined.
7.13.050 T.	Synthetic liners shall meet the guidelines established by NRCS Conservation Practice Standard "Pond Sealing or Lining-Flexible Membrane No. 521-A" or its revisions.

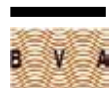
Section 6

Comparison of Requirements Intended to Protect Groundwater Quality

Table 6-1 at the end of this section presents a comparative summary of the Title 27 minimum standards with local California jurisdictions and other state requirements intended to protect groundwater quality from confined animal facility wastes. The federal NPDES requirements are not included in Table 6-1 because they contain few specific provisions to protect groundwater quality. However, the federal requirements do specify BMPs be employed at each regulated facility (the NRCS Standards are generally considered to represent BMPs). Although there is variation in the requirements, the following general observations that pertain to groundwater quality protection may be derived from the information in Table 6-1:

- A number of states and one of the local counties (Kings County) require comprehensive site characterization and development studies be completed to assess the soils and groundwater conditions in areas proposed for animal facility waste management. Current Title 27 regulations do not include similar requirements.
- Title 27 does not include any criteria for siting, construction, operation, maintenance, or closure of retention ponds, corrals, or milk parlors and only requires that lagoons and retention pond liners or underlying geologic materials contain at least ten percent clay and no more than ten percent gravel. Title 27 also does not require design and construction in conformance with an identified standard. In contrast, some other states, and some California counties (e.g. Kings County and Merced County) require facilities that are designed and constructed in conformance with the NRCS Standards. These guidelines include a quantifiable maximum liner permeability of 1×10^{-6} cm/sec.
- Title 27 does not have groundwater separation requirements for confined animal facility lagoons or retention basins.³ Requirements for some states and some California counties (Kings County and Merced County) include groundwater separation standards that vary from 1 foot to 5 feet depending partially on site-specific conditions.
- Kings County requires corrals and dry manure storage areas to be underlain by imported or naturally-occurring clay soil with not less than 20 percent clay or silt. Kings County also requires specific maintenance of manured areas and that care shall be taken not to disturb the seal layer of corrals. In addition to Kings County – Merced County, CCR Title 3, and the CDFA all have corral requirements.

³ The 1995 Basin Plan for the Tulare Lake Basin requires new retention ponds be sited, designed, constructed, and operated to ensure that the invert of the pond will be at least five feet above the highest anticipated elevation of groundwater.



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- Title 27 does not require professional certification that confined animal waste management facilities are designed and constructed in accordance with any particular standards or plans. Some other states and some California counties (Kings County, Merced County) require professional certification that facilities are designed and constructed in accordance with the applicable design standards and plans.

Comparison of Regulations

<p>Table 6-1 Summary of Title 27, Title 3, Other States, and Local Requirements Confined Animal Facility Requirements Intended to Protect Groundwater Quality</p>				
Component	Title 27 Requirements	Title 3 Requirements	Other States Requirements	Local Requirements (Kings And Merced Counties)
SITING REQUIREMENTS				
Pre-Construction/Development Site Characterization or Studies	No requirements.	No Requirements	Variable. A number of states include prescriptive siting criteria. A number of states require subsurface investigations for design of waste lagoons and retention basins. Several states specify conformance with NRCS Standards. See Tables 4-1 through 4-4.	Kings County requires sufficient subsurface sampling and testing to classify and characterize the soils and groundwater conditions in areas of proposed dairy facility structures, corrals, feed and manure storage areas, lagoon, and cropland where process water and manure are spread. The report shall include recommendations for foundation design, cut and fill slope design, berm or embankment design, and site grading. See Table 5-1. Merced County does not require specific pre-construction or development studies, although the CNMP must include information regarding the highest groundwater depth, groundwater elevation and elevation of the bottom of the retention pond and settling basin.
Setbacks from Surface and Groundwater	No specific requirements.	Requires well setbacks from animal enclosures, septic tank leach lines, and seepage pits.	Variable. Most states requirements identified for this investigation include prescriptive set-backs from surface and groundwater. The set-back distances vary between states. See Table 4-4.	Kings County requires that the potential for discharge of water-borne pathogens to existing and proposed domestic water supply wells shall be minimized by ensuring that the domestic wells are constructed in accordance with the California Well Standards and that appropriate minimum setbacks (150 feet, or other distance set in the Waste Discharge Requirements issued for the dairy by the RWQCB) between domestic wells and potential sources of pollution are maintained. See Table 5-1. Merced County requires the setbacks summarized in Table 5-2.



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Table 6-1 Summary of Title 27, Title 3, Other States, and Local Requirements Confined Animal Facility Requirements Intended to Protect Groundwater Quality				
Component	Title 27 Requirements	Title 3 Requirements	Other States Requirements	Local Requirements (Kings And Merced Counties)
DESIGN REQUIREMENTS				
General Design Standards	Limited. Lagoons and retention pond liners or underlying geologic materials must contain at least ten percent clay and no more than ten percent gravel.	Requires milk barns, milk houses, and ramps be paved with concrete or equivalent material and sloped to drain. Requires roof drainage from barns and milk houses not drain to corrals unless the corrals are paved and properly drained.	Variable. Most states requirements identified for this investigation specify conformance with NRCS Standards. See Tables 4-3 and 4-4.	Kings County references NRCS Standards. See Table 5-1. Merced County requires conformance with the minimum standards included CCR Title 27 and the requirements of the Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. Merced County also requires conformance with NRCS Standards for retention ponds and settling basins. See Table 5-3.
Separation From Base of Lagoon or Retention Pond to Highest Anticipated Groundwater	No groundwater separation requirements are included in Title 27. However, the 1995 Basin Plan for the Tulare Lake Basin requires new retention ponds be sited, designed, constructed, and operated to ensure that the invert of the pond will be at least 5 feet above the highest anticipated elevation of groundwater.	No requirements	Variable. Some states identified for this investigation have no separation requirements. Other states identified for this investigation vary the groundwater separation requirement from 1 foot to 4 feet above the highest anticipated groundwater level. See Tables 4-3 and 4-4.	Kings requirements a minimum separation distance of 5 feet. See Table 5-1. Merced County requires a minimum separation of 2 feet, except in "sensitive groundwater areas," where a distance of 5 feet is required unless a synthetic liner is constructed. See Table 5-3.
Liner Thickness or Seepage/Permeability Requirements	No specific requirements.	No requirements	Variable. Idaho requires 2 feet compacted soil, concrete, asphalt, or synthetic. Indiana requires 2 feet compacted clay or synthetic. Most states identified for this investigation included a quantified maximum seepage rate or maximum liner permeability requirement for lagoons and retention basins. See Table 4-3.	Kings and Merced Counties require conformance with the NRCS liner permeability standard of 1x10 ⁻⁶ cm/sec. Merced County also requires that any liner installed by importing soil shall have a thickness of at least one (1) foot. See Tables 5-1 and 5-2.

Comparison of Regulations

Table 6-1 Summary of Title 27, Title 3, Other States, and Local Requirements Confined Animal Facility Requirements Intended to Protect Groundwater Quality				
Component	Title 27 Requirements	Title 3 Requirements	Other States Requirements	Local Requirements (Kings And Merced Counties)
Liner Material Required.	Lagoons and retention pond liners or underlying geologic materials must contain at least 10% clay and no more than 10% gravel.	No requirements	Variable. Most states identified for this investigation required: (1) conformance with NRCS Standards (design); and (2) compacted clay or synthetic materials sufficient to meet a quantifiable seepage or permeability standard. See Table 4-3.	Compacted clay or synthetic material sufficient to meet the permeability requirements. Merced County requires compacted soil liners to be at least 1 foot thick. See Tables 5-1 and 5-3.
Corral and Dry Manure Area Standards	Corrals must be managed to minimize infiltration. No other quantifiable standard or requirement	Requires pavement and drainage in selected areas	No specific requirements identified.	Kings County requires corrals and dry manure storage areas to be underlain by imported or naturally-occurring clay soil with not less than 20% clay or silt. Merced County requires silage and manure storage areas be underlain by impervious materials. See Table 5-2.
Milk Parlors	No specific requirements	Requires concrete or equal pavement and drainage	None identified in the documents reviewed for this task report	No specific requirements identified
CONSTRUCTION REQUIREMENTS				
Construction Certification	No specific requirements	No requirements	Variable. Some states identified for this investigation require professional certification that the confined animal facility structures were constructed in accordance with the applicable design standards and plans. See Table 4-4.	Kings and Merced Counties require professional certification that facilities were constructed in accordance with the applicable design standards and plans. See Tables 5-1, 5-2, and 5-3.



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Table 6-1 Summary of Title 27, Title 3, Other States, and Local Requirements Confined Animal Facility Requirements Intended to Protect Groundwater Quality				
Component	Title 27 Requirements	Title 3 Requirements	Other States Requirements	Local Requirements (Kings And Merced Counties)
OPERATIONS AND MAINTENANCE				
General inspections, Reporting, and Corrective Action	No specific requirements	No specific requirements	None identified in the documents reviewed for this task report.	Kings and Merced Counties require routine inspections, reporting and corrective action (if necessary) for waste management facilities. See Tables 5-1 and 5-2.
Corral Maintenance	No specific requirements	No specific requirements	None identified in the documents reviewed for this task report	Kings and Merced Counties require manure removal from corrals on a periodic basis. Kings County also requires maintenance of manured areas and specifies that care shall be taken not to disturb the seal layer of corrals. See Tables 5-1 and 5-2.
Groundwater Monitoring	Groundwater monitoring is not specified as a condition of approval but may be required by the CVRWQCB.	No requirements	Variable. Some states identified for this investigation have no groundwater monitoring requirements, some require groundwater monitoring on a case-by-case basis, and some states include prescriptive monitoring requirements. See Tables 4-2, 4-3, and 4-4.	May be required by Kings and Merced Counties on a case-by-case basis. See Table 5-1.
CLOSURE				
Closure Requirements	No specific requirements.	No requirements	Several states identified for this investigation have closure design and certification requirements for lagoons and retention ponds. See Table 4-4.	Merced County includes specific closure requirements. See Table 5-2.

Section 7

Effectiveness of Regulations in Protecting Groundwater

Although only limited data is available to provide a quantitative determination of the effectiveness of federal, other states, and local regulations in protecting groundwater quality, some qualitative conclusions and judgments regarding these regulations are summarized below.

7.1 Siting Requirements

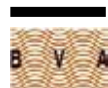
A number of states and local jurisdictions require conformance with NRCS Standards, and these standards explicitly acknowledge the need for site characterization studies and the influence of site-specific conditions on waste management facility performance. As an example, NRCS (1997b) recommends that retention ponds underlain by soils with less than 20 percent clay be lined because coarse-grained soils with less than 20 percent low plasticity fines have the potential to allow rapid movement of polluted water and are also deficient in adsorptive properties because of their lack of clay. The importance of site-specific conditions is demonstrated by published studies (e.g. Glanville, et al. 1999 and NCDENR 1998) that show the need for detailed siting, design, and construction guidelines which recognize the differences in the performance potential of various soils and geologic materials. It is therefore reasonable to conclude that regulations requiring consideration of site-specific conditions will be relatively more effective in protecting groundwater quality compared with standards that do not explicitly address site-specific conditions or require confined animal facility components to be designed to account for subsurface conditions.

7.2 Design Requirements

7.2.1 Retention Ponds and Lagoons

Many states and local requirements identified for this study require conformance with the NRCS design standards for retention ponds and lagoons. The NRCS liner permeability standard of 1×10^{-6} cm/sec is more protective of groundwater than the Title 27 requirement that retention ponds be lined with or underlain by soils that contain at least ten percent clay and not more than ten percent gravel. This is because Title 27 does not include a maximum permeability requirement and there is no assurance that a soil containing ten percent clay will not have relatively high permeability.⁴ The significance of increased permeability is

⁴ This is because soil permeability depends not only on grain size, but also on particle gradation, soil type, construction procedures, degree of saturation, and soil "defects" such as fissures or cracks (Mitchell 1992; Driscoll 1986; NRCS 1997b). The potential range in soil permeability for soils that contain at least ten percent clay is illustrated by Bowles (1982) who indicates a range in permeability of about 10^{-3} cm/sec to 10^{-7} for soils classified as clayey sand (SC). In accordance with the Unified Soil Classification System, clayey sands contain more than 12 percent clay. By way of comparison, NRCS (1997b) guidelines indicate liners with a permeability of 10^{-6} cm/sec will result in acceptable seepage losses for most waste management structures.



shown in Table 7-1 at the end of this section which indicates, all factors being equal, each order of magnitude increase in hydraulic conductivity will result in a tenfold increase in seepage and a tenfold increase in contaminant transport.

However, it is noted that the NRCS Standards may not be sufficient for all geologic environments. For example, in 1998, NCDENR completed a study of 11 confined animal facilities that were constructed to NRCS Standards to determine whether these standards provide adequate groundwater protection. The results of this study showed no indication of groundwater contamination from those facilities located in “less vulnerable” geologic environments.⁵ However, wells at three of the four moderately-vulnerable sites showed an increasing trend in concentrations of one or more lagoon seepage indicators and wells at one of the two vulnerable sites showed lagoon seepage contamination from ammonia, potassium, and nitrates. These results indicate that the NRCS standards may be effective in limiting groundwater contamination in some geologic environments, but may not be sufficient by themselves for all geologic conditions. As a result, the NRCS recommends cement or synthetic liners be constructed in certain geologic environments (typically those sites underlain by coarse-grained soil or fractured bedrock). The results of published studies (Arnold and Meister 1999; Minnesota Pollution Control Agency 2001) indicate cement and synthetic liners are more effective than compacted clay for reducing groundwater contamination.

7.2.2 Corrals

The NRCS Standards do not specifically address corrals and little data was available regarding other states’ design requirements specific to corrals. Kings County requires corrals and dry manure storage areas to be underlain by imported or naturally-occurring clay soil with not less than 20 percent clay or silt and that the corrals be sloped to drain. For maintenance, Kings County requires the aforementioned areas to have depressions filled and to be cautious to avoid disturbing the seal layer. In addition to these regulations, the CCR Title 3 has corral requirements including that a means for drainage must be provided. Unpaved corrals cannot be located closer than 25 feet from a milking area and must have a minimum slope which is dependant on the number of animals. For paved areas, sloped drainage must be curbed with a minimum design of six inches high and six inches wide.

By themselves, these requirements may or may not provide groundwater protection depending largely on site-specific meteorological and hydrogeological conditions, and operations practices. Although it is reasonable to conclude that a soil with not less than 20 percent clay or silt will limit infiltration and seepage to the groundwater compared with more coarse-grained materials, without an appropriate, quantifiable infiltration standard and without consideration of site-specific subsurface conditions, a 20 percent silt or clay

⁵ For the purposes of the NCDENR study, “vulnerable” conditions were assumed to exist where: insufficient separation distance exists between the lagoon bottom and the seasonal high-water table; coarse-grained soils and sediments are dominant above the first significant clay layer in the subsurface; and/or clay layers in the surficial aquifer are discontinuous and imbedded with coarse-grained material.

requirement provides limited assurance that groundwater will not be affected above regulatory limits by infiltration from manured areas such as corrals.

7.2.3 Milk Parlors

CCR Title 3 requires that milk parlors and appurtenant structures such as ramps be paved with concrete or an equal material, guttered, and sloped to drain. Properly constructed and maintained, concrete is relatively impervious and it is reasonable to conclude that the Title 3 requirements are relatively effective in limiting the infiltration of wastewater and commingled animal wastes to the groundwater.

7.3 Construction Requirements

Some states and local jurisdictions require professional certification for construction of various confined animal facilities. Construction monitoring and certification is important to groundwater protection to provide the documentation and assurance that the facilities were constructed in accordance with the approved standards, plans, and specifications for the project.

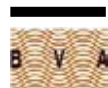
7.4 Operations and Maintenance Requirements

Principal operations and maintenance requirements identified as part of this investigation included corrective actions, routine inspections, and periodic removal of manure from corral areas and retention ponds. Some states require groundwater monitoring at confined animal facilities although groundwater monitoring is more frequently required on a case-by-case basis. The effectiveness of these requirements in providing groundwater quality protection will depend largely on the nature of subsurface conditions at the facility.⁶ In general, these requirements will be relatively protective of groundwater quality by allowing timely repair of waste management facilities such as retention ponds as necessary and by reducing the amount of potential contaminant sources (i.e. the manure in corral areas and at the bottom of retention ponds).

7.5 Closure Requirements

Identified closure requirements for confined animal facilities typically include removal of manure from corralled areas and removal of collected manure and sludge from retention ponds and lagoons. These requirements will be relatively effective in protecting groundwater quality because they will remove the potential contaminant source materials.

⁶ For example, periodic removal of manure from corral areas or retention ponds that are underlain by coarse-grain soils and/or high groundwater may be relatively effective in protecting groundwater quality by removing contaminant source materials. These same removal practices may be less important in areas with lesser potential for contaminant migration to the groundwater.



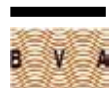
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TABLE 7-1
Comparative Assessment of Flux and Contaminant Loading at Base of Liner
Under Different Hydraulic Conductivity and Wastewater Depth Assumptions

WASTEWATER DEPTH (Feet Above Liner)	LINER SATURATED HYDRAULIC CONDUCTIVITY (cm/sec)				
	1.00E-03	1.00E-04	1.00E-05	1.00E-06	1.00E-07
	<i>Total Flux (gallons per acre per year)</i>				
4	1,685,586,784	168,558,678	16,855,868	1,685,587	168,559
9	3,371,173,569	337,117,357	33,711,736	3,371,174	337,117
14	5,056,760,353	505,676,035	50,567,604	5,056,760	505,676
19	6,742,347,137	674,234,714	67,423,471	6,742,347	674,235
	<i>Total Nitrogen (pounds per acre per year)</i>				
4	7,692,958	769,296	76,930	7,693	769
9	15,385,916	1,538,592	153,859	15,386	1,539
14	23,078,875	2,307,887	230,789	23,079	2,308
19	30,771,833	3,077,183	307,718	30,772	3,077
	<i>Total Salts (pounds per acre per year)</i>				
4	41,670,190	4,167,019	416,702	41,670	4,167
9	83,340,381	8,334,038	833,404	83,340	8,334
14	125,010,571	12,501,057	1,250,106	125,010	12,501
19	166,680,762	16,668,076	1,666,808	166,680	16,668
NOTES: <ol style="list-style-type: none"> 1. Calculations assume steady-state flow and constant hydraulic conductivity through 1 foot thick soil liner. 2. Nitrogen loading based on average nitrogen wastewater concentration of 600 mg/L (midpoint of 200 mg/L to 1,000 mg/L range reported in the text for anaerobic retention ponds). Calculations assume no attenuation of nitrogen in the liner. 3. Salt loading based on an average total salt concentration of 3,250 mg/L (based on the 2,000 mg/L to 4,500 mg/L range reported in the text for anaerobic retention ponds). Calculations assume no attenuation of salts in the liner. 					

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